Thermoluminescence dosimetry properties and kinetic parameters of lithium potassium borate glass co-doped with titanium and magnesium oxides

ABSTRACT

Lithium potassium borate (LKB) glasses co-doped with TiO2 and MgO were prepared using the melt quenching technique. The glasses were cut into transparent chips and exposed to gamma rays of 60Co to study their thermoluminescence (TL) properties. The TL glow curve of the Ti-doped material featured a single prominent peak at 230 ℃. Additional incorporation of MgO as a co-activator enhanced the TL intensity threefold. LKB:Ti,Mg is a low-Z material (Zeff=8.89) with slow signal fading. Its radiation sensitivity is 12 times lower that the sensitivity of TLD-100. The dose response is linear at doses up to 103 Gy. The trap parameters, such as the kinetics order, activation energy, and frequency factor, which are related to the glow peak, were determined using TolAnal software.

Keyword: Thermoluminescence; Lithium potassium borate glass; Titanium oxide; Glow curve deconvolution